AUTOMOTIVE: BRAKE SYSTEMS

COURSE DESCRIPTION

Automotive: Brake Systems course offers training in the diagnosis and repair of hydraulic, mechanical, and electrical systems used in standard and anti-lock brake systems. Course content includes diagnosis, repair, and/or service technology of hydraulic and antilock brake systems to original equipment manufacture (OEM) specifications. Educational experiences simulate automotive service industry operations through training aids, laboratory facilities, and school-based learning opportunities.

Course content prepares students for the Automotive Service Excellence (ASE) Brake System test, for entry level placement in the workforce, and for entry into post-secondary education.

Recommended: Transportation Core

Requirement: A minimum of 105 hours must be dedicated to brake systems to meet minimum standards set by NATEF.

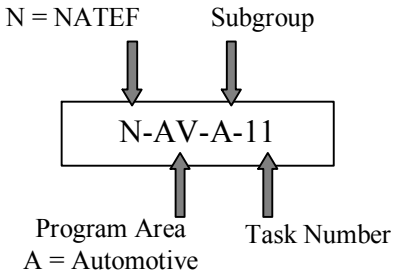
Recommended Credits: **1 or 2 (NATEF certified programs only)**

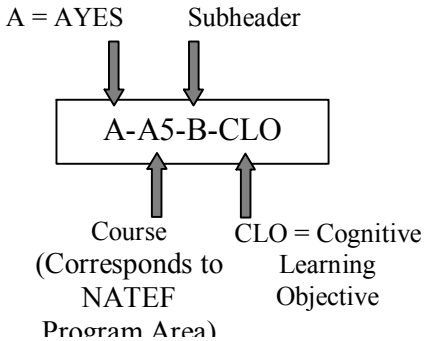
Recommended Grade Level(s): 10th, 11th, 12th

Number of Competencies in Course: 54 / 79

Note: Course is aligned with NATEF task list for Automotive: Brake Systems. Items have been organized based on requirements of Tennessee required course description format.

Brakes





AUTOMOTIVE: BRAKE SYSTEMS STANDARDS

1.0 Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

2.0 Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements, for an automotive repair facility.

3.0 Students will properly test, diagnose, service, and repair General Brake Systems.

4.0 Students will properly test, diagnose, service, and repair Hydraulic System.

5.0 Students will properly test, diagnose, service, and repair Drum Brake.

6.0 Students will properly test, diagnose, service, and repair Disc Brake.

7.0 Students will properly test, diagnose, service, and repair Power Assist Units.

8.0 Students will properly test, diagnose, service, and repair Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.).

9.0 Students will properly test, diagnose, service, and repair Antilock Brake and Traction Control Systems.

10.0 Students will demonstrate communication skills required in the automotive service industry.

11.0 Students will demonstrate interpersonal and employability skills required in the automotive service industry.

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 1.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

1.1 Exhibit positive leadership skills.
1.2 Participate in SkillsUSA as an integral part of classroom instruction.
1.3 Assess situations and apply problem-solving and decision-making skills to client relations in the community and workplace.
1.4 Demonstrate the ability to work cooperatively with others in a professional setting.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

1.1 Demonstrates character, leadership, and integrity using creative and critical-thinking skills.
1.2A Applies the points of the creed to personal and professional situations.
1.2B Participates and conducts meetings and other business according to accepted rules of parliamentary procedure.
1.3 Analyzes situations in the workplace and uses problem-solving techniques to solve the problem.
1.4A Participates in a community service project.
1.4B Assists with an officer campaign with Tennessee SkillsUSA.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various SkillsUSA programs and/or competitive events.
- Evaluate an activity within the school, community, and/or workplace and project effects of the project.
- Implement an annual program of work.
- Prepare a meeting agenda for a SkillsUSA monthly meeting.
- Attend a professional organization meeting.
- Participate in the American Spirit Award competition with SkillsUSA.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program,* SkillsUSA, Communications and Writing Skills, Teambuilding Skills, Research, Language Arts, Sociology, Psychology, Math, Math for Technology, Applied Communications, Social Studies, Problem Solving, Interpersonal Skills, Employability Skills, Critical-Thinking Skills, SCANS (Secretary's Commission on Achieving Necessary Skills), Chamber of Commerce, Colleges, Universities, Technology Centers, and Employment Agencies

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 2.0

Students will demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements, for an automotive repair facility.

LEARNING EXPECTATIONS

The student will:

2.1 Determine the safe and correct application for chemicals used in brake systems.
2.2 Use protective clothing and safety equipment.
2.3 Use fire protection equipment.
2.4 Follow OSHA and EPA regulations and manufacturer specifications affecting brake systems technology.
2.5 Respond to safety communications referring to brake systems.
2.6 Passes a written safety examination with 100% accuracy.
2.7 Passes a performance examination on equipment with 100% accuracy.
2.8 Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

2.1A Conforms to federal, state, and local regulations and manufacturers specifications when handling, storing, and disposing of chemicals.
2.1B Ensures proper ventilation for chemical use.
2.1C Inspects first aid supplies.
2.2A Demonstrates proper usage of special safety equipment.
2.2B Selects and uses the appropriate protective clothing and eye protection.
2.3A Distinguishes the proper fire extinguisher for each class of fire.
2.3B Inspects fire extinguishers and determines their effectiveness.
2.4A Locates regulatory information and manufacturer recalls.
2.4B Extracts information from Material Safety Data Sheets pertaining to shop chemicals.
2.4C Complies with relevant regulations and standards.
2.5A Interprets brake systems manufacturer correspondence for safety regulations.
2.5B Complies with safety procedures.
2.6 Passes a written safety examination with 100% accuracy.
2.7 Passes a performance examination on equipment with 100% accuracy.
2.8 Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

- Assess the work area for safety hazards.
- Design a corrections program for identified hazards.
- Model the appropriate protective equipment for an assigned task.
- Read manufacturer specifications to determine safe practice while working on various brake systems.
- Using case scenarios, determine the results of unsafe practices including accidents, cost effectiveness, time management, and cost to the technicians.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 3.0

Students will properly test, diagnose, service, and repair General Brake Systems.

LEARNING EXPECTATIONS

The student will:

3.1 Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1

3.2 Identify and interpret brake system concern; determine necessary action. P-1

3.3 Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. P-1

3.4 Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

3.1 Completes work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. N-AV-A-1

3.2 Identifies and interprets brake system concern; determines necessary action. N-AV-A-2

3.3 Researches applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. N-AV-A-3

3.4 Locates and interprets vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals. N-AV-A-4

SAMPLE PERFORMANCE TASKS

- Use reference materials to determine procedures for diagnosing and testing brake systems.
- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 4.0

Students will properly test, diagnose, service, and repair Hydraulic System.

LEARNING EXPECTATIONS

The student will:

4.1 Diagnose pressure concerns in the brake system using hydraulic principles (Paschal's Law). P-1

4.2 Measure brake pedal height; determine necessary action. P-2

4.3 Check master cylinder for internal and external leaks and proper operation; determine necessary action. P-2

4.4 Remove, bench bleed, and reinstall master cylinder. P-1

4.5 Diagnose poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-1

4.6 Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. P-2

4.7 Fabricate and/or install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed. P-2

4.8 Select, handle, store, and fill brake fluids to proper level. P-1

4.9 Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves. P-2

4.10 Inspect, test, and adjust height (load) sensing proportioning valve. P-3

4.11 Inspect, test, and/or replace components of brake warning light system. P-3

4.12 Bleed (manual, pressure, vacuum or surge) brake system. P-1

4.13 Flush hydraulic system. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

4.1 Diagnoses pressure concerns in the brake system using hydraulic principles (Pascal's Law). N-AV-B-1

4.2 Measurse brake pedal height; determines necessary action. N-AV-B-2

4.3 Checks master cylinder for internal and external leaks and proper operation; determines necessary action. N-AV-B-3

4.4 Removes, bench bleeds, and reinstalls master cylinder. N-AV-B-4

4.5 Diagnoses poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determines necessary action. N-AV-B-5

4.6 Inspects brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determines necessary action. N-AV-B-6

4.7 Fabricates and/or installs brake lines (double flare and ISO types); replaces hoses, fittings, and supports as needed. N-AV-B-7

4.8 Selects, handles, stores, and fills brake fluids to proper level. N-AV-B-8

4.9 Inspects, tests, and/or replaces metering (hold-off), proportioning (balance), pressure differential, and combination valves. N-AV-B-9
4.10 Inspects, tests, and adjusts height (load) sensing proportioning valve. N-AV-B-10
4.11 Inspects, tests, and/or replaces components of brake warning light system. N-AV-B-11
4.12 Bleeds (manual, pressure, vacuum or surge) brake system. N-AV-B-12
4.13 Flushes hydraulic system. N-AV-B-13

SAMPLE PERFORMANCE TASKS

- Remove and replace master cylinder.
- Pressure-bleed brake system.
- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Chemistry, Technology Literacy, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, Critical Thinking and Problem Solving, Computer Skills, Internet Navigation, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 5.0

Students will properly test, diagnose, service, and repair Drum Brake

LEARNING EXPECTATIONS

The student will:

5.1 Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1

5.2 Remove, clean (using proper safety procedures), inspect, and measure brake drums; determine necessary action. P-1

5.3 Refinish brake drum. P-1

5.4 Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1

5.5 Remove, inspect, and install wheel cylinders. P-2

5.6 Pre-adjusts brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings. P-1

5.7 Installs wheel and torques lug nuts and makes final checks and adjustments. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

5.1 Diagnoses poor stopping, noise, pulling, grabbing, dragging, or pedal pulsation concerns and determines necessary action. N-AV-C-1

5.2 Removes, cleans(using proper safety procedures), inspects, and measures brake drums; determines necessary action. N-AV-C-2

5.3 Refinishes brake drum. N-AV-C-3

5.4 Removes, cleans, and inspects brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. N-AV-C-4

5.5 Removes, inspects, and installs wheel cylinders. N-AV-C-5

5.6 Pre-adjusts brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings. N-AV-C-6

5.7 Installs wheel and torques lug nuts and makes final checks and adjustments. N-AV-C-7

SAMPLE PERFORMANCE TASKS

- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.

Make the repair.
Test the repair.

- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 6.0

Students will properly test, diagnose, service, and repair Disc Brake

LEARNING EXPECTATIONS

The student will:

6.1 Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1

6.2 Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action. P-1

6.3 Clean and inspect caliper mounting and slides for wear and damage; determine necessary action. P-1

6.4 Remove, clean, and inspect pads and retaining hardware; determine necessary action. P-1

6.5 Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. P-2

6.6 Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks. P-1

6.7 Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace. P-1

6.8 Remove and reinstall rotor. P-1

6.9 Refinish rotor on vehicle. P-1

6.10 Refinish rotor off vehicle. P-1

6.11 Adjust calipers equipped with an integrated parking brake system. P-3

6.12 Install wheel, torque lug nuts, and make final checks and adjustments. P-1

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

6.1 Diagnoses poor stopping, noise, pulling, grabbing, dragging, or pedal pulsations concerns for disc brakes; determine necessary action. N-AV-D-1

6.2 Removes caliper assembly from mountings; cleans and inspects for leaks and damage to caliper housing; determines necessary action. N-AV-D-2

6.3 Cleans and inspects caliper mounting and slides for wear and damage; determines necessary action. N-AV-D-3

6.4 Removes, cleans, and inspects pads and retaining hardware; determines necessary action. N-AV-D-4

6.5 Disassembles and cleans caliper assembly; inspects parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. N-AV-D-5

6.6 Reassembles, lubricates, and reinstalls caliper, pads, and related hardware; seat pads, and inspects for leaks. N-AV-D-6

6.7 Cleans, inspects, and measures rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace. N-AV-D-7

6.8 Removes and reinstalls rotor. N-AV-D-8
6.9 Refinishes rotor on vehicle. N-AV-D-9
6.10 Refinishes rotor off vehicle. N-AV-D-10
6.11 Adjusts calipers equipped with an integrated parking brake system. N-AV-D-11
6.12 Installs wheel, torque lug nuts, and makes final checks and adjustments. N-AV-D-12

SAMPLE PERFORMANCE TASKS

- Resurface brake rotor.
- Remove and replace brake caliper.
- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 7.0

Students will properly test, diagnose, service, and repair Power Assist Units.

LEARNING EXPECTATIONS

The student will:

7.1 Test pedal free travel with and without engine running; check power assist operation. P-2
7.2 Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-2
7.3 Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action. P-2
7.4 Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action. P-3
7.5 Measure and adjust master cylinder pushrod length. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

7.1 Tests pedal free travel with and without engine running; check power assist operation. N-AV-E-1
7.2 Checks vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. N-AV-E-2
7.3 Inspects the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action. N-AV-E-3
7.4 Inspects and test hydraulically assisted power brake system for leaks and proper operation; determines necessary action. N-AV-E-4
7.5 Measures and adjusts master cylinder pushrod length. N-AV-E-5

SAMPLE PERFORMANCE TASKS

- Using gauges and rulers; follow manufacturer recommendations for measuring pedal travel.
- Using vacuum gauges to determine check valve operation and booster operation.
- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 8.0

Students will properly test, diagnose, service, and repair Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.).

LEARNING EXPECTATIONS

The student will:

8.1 Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-1

8.2 Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings. P-1

8.3 Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed. P-2

8.4 Check parking brake operation; determine necessary action. P-1

8.5 Check operation of parking brake indicator light system. P-3

8.6 Check operation of brake stop light system; determine necessary action. P-1

8.7 Replace wheel bearing and race. P-1

8.8 Inspect and replace wheel studs. P-1

8.9 Remove and reinstall sealed wheel bearing assembly. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

8.1 Diagnoses wheel bearing noises, wheel shimmy, and vibration concerns and determines necessary action. N-AV-F-1

8.2 Removes, cleans, inspects, repacks, and installs wheel bearings and replaces seals; installs hub and adjusts wheel bearings. N-AV-F-2

8.3 Checks parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed. P-2 N-AV-F-3

8.4 Checks parking brake operation; determines necessary action.. N-AV-F-4

8.5 Checks operation of parking brake indicator light system. P-3 N-AV-F-5

8.6 Checks operation of brake stop light system; determines necessary action. N-AV-F-6

8.7 Replaces wheel bearing and race. N-AV-F-7

8.8 Inspects and replaces wheel studs. N-AV-F-8

8.9 Removes and reinstalls sealed wheel bearing assembly. P-2 N-AV-F-9

SAMPLE PERFORMANCE TASKS

- Remove and replace wheel bearing and race.
- Check and adjust parking brakes.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA-VICA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 9.0

Students will properly test, diagnose, service, and repair Antilock Brake and Traction Systems Control

LEARNING EXPECTATIONS

9.1 Identify and inspect antilock brake system (ABS) components; determine necessary action. P-1

9.2 Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the antilock brake system (ABS); determine necessary action. P-2

9.3 Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action. P-1

9.4 Depressurize high-pressure components of the antilock brake system (ABS). P-3

9.5 Bleed the antilock brake system's (ABS) front and rear hydraulic circuits. P-2

9.6 Remove and install antilock brake system (ABS) electrical/electronic and hydraulic components. P-3

9.7 Test, diagnose and service ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). P-1

9.8 Diagnose antilock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-3

9.9 Identify traction control system/vehicle stability control system components. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

9.1 Inspects and tests antilock brake system (ABS) components and determines necessary action. N-AV-G-1

9.2 Diagnoses poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the antilock brake system (ABS); determines necessary action. N-AV-G-2

9.3 Diagnoses antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determines necessary action. N-AV-G-3

9.4 Depressurizes high-pressure components of the antilock brake system (ABS). N-AV-G-4

9.5 Bleeds the antilock brake system's (ABS) front and rear hydraulic circuits. N-AV-G-5

9.6 Removes and installs antilock brake system (ABS) electrical/electronic and hydraulic components. N-AV-G-6

9.7 Tests, diagnoses and services ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). N-AV-G-7

9.8 Diagnoses antilock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). N-AV-G-8

9.9 Identifies traction control system/vehicle stability control system components. N-AV-G-9

SAMPLE PERFORMANCE TASKS

- Use a scan tool and the appropriate Diagnostic Procedures Manual to test an antilock brake system (ABS).
- Bleed an antilock brake system (ABS).
- Determine the cause of an intermittent electrical problem in an antilock brake system (ABS).
- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 10.0

Students will demonstrate communication skills required in the automotive service industry.

LEARNING EXPECTATIONS

The student will:

10.1 Communicate and comprehend oral and written information typically occurring in the automotive service workplace referring to brake systems.

10.2 Solve brake problems and make decisions using a logical process, based on information communicated to them.

10.3 Use teamwork skills to accomplish goals, solve problems, and manage conflict within groups.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

10.1A Interprets and uses written information in common job formats, such as tables, charts, and reference materials and manuals.

10.1B Interprets and uses graphical information such as blueprints, electrical schematics, process control schematics, automotive flow charts, and other automotive diagrams referring to brake systems.

10.1C Uses electronic resources to obtain diagnostic service and other automotive information.

10.1D Analyzes information obtained from various sources to determine a diagnostic approach.

10.1E Communicates clearly and appropriately in oral and written form.

10.1F Interprets automotive repair orders for brake systems.

10.2A Develops a hypothesis regarding the cause of a problem.

10.2B Tests the hypothesis to determine the solution to the problem.

10.2C Creates, evaluates, and revises as needed a plan to resolve a problem.

10.2D Follows strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.

10.3A Serves in each of the functional roles of a team within a service facility.

10.3B Resolves conflicts within a group.

10.3C Demonstrates appropriate and positive examples of giving and accepting criticism.

10.3D Modifies behavior and revises work based on appropriate criticism.

10.3E Cooperates with other members of a group to research future trends in brake systems.

10.3F Evaluates the role of the automotive technician within the organizational system of a dealership or fleet shop.

SAMPLE PERFORMANCE TASKS

- Use reference materials to determine procedures for diagnosing and testing brake systems.
- Work as a team member to develop a diagnostic strategy.
- Use blueprints and diagrams to execute a task.
- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

Mathematics, Math for Technology, Physics, Science, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), SkillsUSA, AYES Curriculum, National Science Foundation, Computer Skills, Internet Navigation Skills, Presentation Skills, Critical Thinking and Problem Solving, Technical Writing Skills, Following Trouble Tree/Schematics, Secretary's Commission on Achieving Necessary Skills (SCANS), Occupational Safety and Health Administration (OSHA), Tennessee Occupational Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA)

AUTOMOTIVE: BRAKE SYSTEMS

STANDARD 11.0

Students will demonstrate interpersonal and employability skills required in the automotive service industry.

LEARNING EXPECTATIONS

The student will:

11.1 Analyze relationships between work ethics, organizational skills, and personal job success.
11.2 Demonstrate attitudes conducive to working in a team.
11.3 Compare the correlation between a clean orderly work environment and successful and efficient job performance.
11.4 Assess implications of diversity for communities and workplaces.
11.5 Develop individual time management and work sequencing skills.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

11.1A Illustrates the concept of a "work ethic."
11.1B Assesses the potential impact of an individual's work ethic on an organizational system.
11.1C Infers the relationship between work ethics and personal job success.
11.2A Judges which attitudes are conducive to success.
11.2B Modifies behavior to reflect attitudes for success.
11.3A Keeps work area organized and free from clutter and maintains tool and equipment control.
11.3B Cleans work area according to shop standard and NATEF, and OSHA requirements.
11.3C Maintains a neat and orderly work area.
11.4A Points out benefits and problems that may arise from diversity in manufacturers.
11.4B Devises solutions to problems arising from diversity in both individuals, culturals, and manufacturers.
11.4C Demonstrates proper dress and grooming for work in an automotive service facility.
11.5A Assesses the benefits of incorporating time management principles into brake service.
11.5B Displays time management and work sequencing skills in brake service.
11.5C Demonstrates the ability to diagnose and repair brake service jobs within the manufacturer's labor operation time.

SAMPLE PERFORMANCE TASKS

- Maintain an orderly work area.
- Consistently arrive at class on time.
- Serve as an intern with a dealership or fleet shop.
- Resolve an interpersonal conflict in the classroom.

- Using case scenarios, follow strategy based diagnostic procedure to:
  - Verify the complaint.
  - Define the problem.
  - Isolate the problem.
  - Validate the problem.
  - Make the repair.
  - Test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description.

INTEGRATION LINKAGES

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AUTOMOTIVE: BRAKE SYSTEMS

SAMPLING OF AVAILABLE RESOURCES

A5 Automotive Brake Systems Course, AYES Curriculum, AYES Corporation, www.ayes.org

A5 Brake Systems, CD-ROM, Interactive Computer Based Training, DVP/CDX

Module 6 Brakes, Instructional Materials Laboratory (IML), University of Missouri

Curriculum Integrator, CORD Communications, Waco, TX 1998

Today's Technician Automotive Brake Systems, Knowles, Delmar Publishing

2002 Automobile Task List, National Automotive Technicians Education Foundation (NATEF), www.natef.org